Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems

ABSTRACT

A method and apparatus that increases bandwidth in Aloha-based frequency hopping transmission systems is disclosed. A first step in improving efficiency of known systems is to increase the number of parallel upstream transmissions by changing known systems from frequency hopping to a parallel transmission model. To increase upstream bandwidth, the first step is to replace the existing headend receiver with one that is capable of simultaneously receiving data from all of the possible upstream channels simultaneously. Next, by treating the head-end receiver and the set-top boxes as an integrated system, it is possible to use the existing transmission spectrum much more efficiently. Instead of enabling each set-top box to perform frequency hopping, it is much more effective if the head-end receiver is made responsible for active frequency management of the upstream transmission spectrum. To do this, when the system is first powered-up, the head-end receiver examines the RF spectrum to determine which frequencies are available, and which are not available due to interference from other sources. After determining which frequencies are free of interference, the headend receiver then polls the node to determine how many set-top boxes are active in this node. Once this is complete, the headend receiver partitions the set-top boxes into an approximately equal number of set-top boxes for each of the available upstream data channels. That is, the boxes are assigned a

transmission channel. The head-end receiver then commands each set-top box to tune to the channel it has been assigned by sending the channel selection information to each set-top box, *i.e.* using the separate downstream transmission channel mentioned above. A second major change to known systems revises the transmission control protocol from an Aloha system to a slotted assignment system. To do this, the head-end receiver is used not just to assign each set-top box a specific transmission channel, but also a specific transmission slot. By assigning a specific set-top box to a particular slot, it becomes possible for multiple set-top boxes to transmit in sequential slots, while assuring that the transmission packets do not collide.